

## INFLUENCE OF SEED SIZE ON SEED YIELD AND QUALITY IN DESI AND KABULI CHICKPEA VARIETIES

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### ABSTRACT

The field studies were conducted to ascertain the influence of four seed size groups (Small, medium, big and bulk) on seed yield and quality in three Desi (A-1, Bheema and BGD-103) and two Kabuli (ICCV-2 and KAK-2) chickpea varieties during rabi seasons of 2007 and 2008 at the department of Seed Science and Technology, University of Agricultural Sciences, Dharwad. The study revealed that big, medium and bulk seeds of each Desi and Kabuli varieties resulted in higher plant height, number of branches, pods per plant, test weight, seed yield, germination and other seed quality parameters compared to small seeds. Among desi varieties, Bheema and BGD-103 recorded more seed yield (34.14 and 34.72 q/ha) respectively, while A-1 recorded less (2956 q/ha) yield. Between kabuli types KAK-2 recorded more (32.73 q/ha) seed yield compared to ICCV-2 (27.66). The interaction effect to varieties and seed size was non-significant on most of the plant growth, seed yield and quality parameters.

**KEYWORDS:** Seed Testing, Seed Size on Growth, Chickpea

### INTRODUCTION

In most of the field crops, seed size is one of the most important aspects of seed quality and its influence on field performance and yield is positively related. The concept of seed size on field performance has been a subject of study by several scientists in maize (Kdikeri, 1991), in sorghum (Dighe and Patil, 1986), in pigeonpea (Verma and Bajpai, 2002), but their findings are found conflicting. In Asia, India is the largest producer of chickpea contributing over 70 percent of the world production occupying an area of 7.49 million hectares with production of 6.33 million tones and with productivity in seed size. The Kabuli Chickpea varieties are generally bigger in size while, Desi varieties are smaller in size. Within the chickpea types seeds also vary much with respect to size and test weight and as such size grading for different varieties seems to be inevitable. Presently irrespective of chickpea varieties 11.75 (R) top and 4.75 (R) to 6.00 (R) sieves are used for grading of seeds. It has been well documented that in large seeded crops size grading found to have no beneficial influence on field performance since bulk seeds were found to yield equally as that of small, medium and big seeds (Verma and Bajpai, 2002 and Tuba, 2009).

In this context, a field study was conducted on influence of seed size in different Kabuli and desi chickpea varieties on seeds yield and quality in department of seed science and technology, University of Agricultural Sciences Dharwad during 2007-08.

### MATERIAL AND METHODS

The seeds of Kabuli varieties viz., KAK-2 and ICCV-2 and Desi varieties viz. A-1, Bheema and BGD-103 were sieve graded using different sieve sizes as small (G1), medium (G2), big (G3) and bulk (G4). Seeds of Kabuli varieties

were sieve graded using 7.0, 8.0 and 9.0 mm round sieves and Desi varieties were sieve graded using 6.40, 7.0 and 7.5 for A-1 and 6.80, 7.50 and 8.0 mm round sieves as small, medium and big seeds respectively along with ungraded as bulk. The seeds of different grades were sown by dibbling in 30 cm rows at 15cm intra row spacing in well prepared seed plots of 2.25 x 1.50 m gross plots with 1.65 x 1.20 m net plots during rabi seasons of 2007 and 2008. The recommended dose of fertilizer (20:50:00 kg NPK/ha) was applied as basal dose for each plot in the form of urea and diammonium phosphate at the time of sowing. Soon after sowing plots were lightly irrigated. The necessary after care operations such as thinning, hand weeding, inter cultivation and need based plant protection measures were carried out. The plots were irrigated four times during seed crop period. The experiment was laid out in RCBD with factorial concept in three replications. The field observations on plant growth at harvest, number of branches per plant, number of pods per plant, number of seeds per pod, seeds per pod and seed yield per hectare were recorded. The seed quality parameters viz., 100 seed weight, germination percentage, vigour index (germination (%) x seedling length) and electrical conductivity were recorded by adopting ISTA Rules (Anon., 1996).

## RESULT AND DISCUSSIONS

It is a well established fact that plant growth, seed yield and yield parameters and seed quality depend largely on genetic make of a variety and also on environmental factors.

### Varietal Influence

In the present study Kabuli and Desi chickpea varieties found to differ in growth, seed yield and seed quality parameters. The plant height at harvest was found to differ significantly among seed size groups irrespective of chickpea varieties. In desi types maximum plant height (53.93 and 53.44 cm) was recorded in Bheema and BGD-103 and minimum (46.13 cm) in A-1. The plant height of Kabuli types were in between of Desi Types. On the contrary number of branches were maximum (23.52) in A-1 followed by Beema and BGD-103 of desi types and were minimum (19.77 and 21.30) in ICCV-2 and KAK-2 varieties belonging to Kabuli types. The differences in plant height and number of branches noticed among chickpea varieties may be due to differences in their genetic makeup and their field performance ability in relation to environmental factors.

The seed yield is a function of number of pods per plant, number of seeds per pod, test weight of seed etc., irrespective of seed size, the seed yield per hectare was more (34.72 q) in BGD-103 followed by Bheema (34.14 q) Desi varieties and was less (27.66 g) in ICCV-2 Kabuli variety. The higher seed yield noticed with Bheema and BGD-103 may be due to higher test weight (38.65 and 38.40 g) respectively. It was closely followed by KAK -2 of Kabuli variety. The differences in seed yield noticed may be due to differences in number of pod per plant, test weight of seeds etc., as these traits are mainly under genetic control (Kurdikeri, 1991, Merwade, 2000).

The seed quality parameters such as germination, vigour index were higher with lower vigour index, electrical conductivity in all the chickpea varieties. However, these traits were relatively higher in Bheema and BGD-103 Desi chickpea varieties followed by KAK-2 and ICCV -2 Kabuli varieties.

### Seed Grade Influence

Seed size *per se* indicates that big seeds with high initial capital of food reserves germinate early, grow vigorously and produce higher yields (Styeret *al.*, 1980). Generally, big and medium seeds perform better in field compared to small

seeds. On the contrary, Khare and Satpute (1999) in pigeonpea reported that small and medium seeds were better in germination and mobilization efficiency than big seeds. While, Tube (2009) did not notice an influence of seed size on growth and yield in chickpea. Hence, seed size *per se* is still a controversial issue and research needs to be carried out in chickpea varieties of Desi and Kabuli type as they vary widely in seed size. Further the field performance ability largely depends on genetic makeup and environmental influences.

In the present study, irrespective of varieties, seed size groups showed differences in plant growth, seed yield and yield parameters. The plant height at harvest among seed size groups ranged between 49.67 cm in small seeds to 52.43 cm in big seeds. Similarly, the number of branches at harvest ranged between 20.13 in small seeds to 23.51 in big seeds. The seed yield parameters such as number of pods per plant were more (55.47) in big seeds followed by medium (54.81) and bulk (54.40) and were less (51.93) in small seed group. Similarly, test weight of seed among seed size groups followed the same trend were in big medium and bulk seeds recorded relatively more (33.58, 33.19 and 32.82 g) respectively and was less (32.08g) test weight in small seed size group. Since the final seed yield per hectare is a function of yield traits, it was higher (33.11 q) in big seeds followed by medium (32.05) and bulk (31.37 q) and lower (30.52 q) in small seeds. The present study indicated that plant growth, seed yield parameters and seed yield were always more in big, medium and bulk seeds and less in small seeds and the results are similar to seed size *per se* concept and are also in conformity with the reports of Bhoret *al.* (1988), Verma *al.* (2005) in bengalgram. All the seed quality parameters were higher in big, medium and bulk seeds compared to small seeds and the results are in conformity with the earlier reports of Shashidhara *et al.* (1987), Verma and Bajpai (2002).

### Interaction Influence

The interaction effects of varieties and seed size category shown non-significant influence on plant height, number of branches, number of pods per plant, test weight, seed yield trait and seed quality parameters indicating the advantage high food reserves contributing towards higher germination in the fields, vigorous growing seedlings with more number of pod bearing branches. Similar beneficial influence of big seed have been reported by Shashidhara *et al.* (1987) in cowpea and Verma and Bajpai (2002) in pigeon pea.

From the results of the present investigation it may be concluded that, big medium and bulk seeds of Desi and Kabuli varieties may be used for planting to obtain higher seed yield with better quality seeds.

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## APPENDICES

**Table 1: Effect of Seed Size on Plant Height, Number of Branches and Number of Pods Per Plant in Chickpea Varieties**

Treatments	At Harvest														
	Plant Height					Number of Branches					Number of Pods Per Plant				
	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	Mean	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	Mean	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	Mean
V <sub>1</sub>	43.17	46.73	47.93	46.70	46.13	21.93	23.73	24.33	24.07	23.52	51.53	56.80	59.00	58.23	56.39
V <sub>2</sub>	48.00	50.70	51.57	49.00	49.82	18.53	18.47	21.73	21.33	19.77	36.60	39.07	38.43	40.50	38.65
V <sub>3</sub>	51.13	52.93	53.67	51.87	52.40	19.13	22.33	22.67	21.07	21.30	40.10	41.33	42.33	38.57	40.58
V <sub>4</sub>	52.53	53.83	54.47	52.87	53.44	19.07	23.37	24.00	21.73	22.04	64.73	66.53	68.43	66.67	66.59
V <sub>5</sub>	53.53	54.27	54.53	53.43	53.93	21.00	23.27	23.80	21.67	22.43	66.67	70.33	69.17	69.73	68.98
Mean	49.67	51.69	52.43	50.77	51.14	20.13	22.43	23.51	21.97	22.01	51.93	54.81	55.47	54.74	54.24
Comparison for Means of	S.E.m±		CD (5%)			S.E.m±		CD (5%)			S.E.m±		CD (5%)		
V	1.35		0.47			0.34		0.96			0.85		2.44		
G	1.21		0.42			0.30		0.86			0.76		2.18		
VxG	2.71		NS			0.67		NS			1.70		NS		

NS- Non Significant	
Varieties (V)	Seed size (G)
V <sub>1</sub> - A-1	G <sub>1</sub> - Small
V <sub>2</sub> - ICCV-2	G <sub>2</sub> - Medium
V <sub>3</sub> - KAK-2	G <sub>3</sub> - Big
V <sub>4</sub> - Bheema	G <sub>4</sub> - Bulk
V <sub>5</sub> - BGD -103	

Table 2: Effect of Seed Size on Seed Yield per Plant, per Plot and per Hectare in Chickpea Genotypes

Treatments	Seed Yield per Plant (g)					Seed Yield per Plot (kg)					Seed yield per Hectare (q)				
	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	Mean	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	Mean	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	Mean
V <sub>1</sub>	11.50	13.07	13.63	12.50	12.68	1.02	1.09	1.20	0.95	1.06	28.24	30.28	33.43	26.30	29.56
V <sub>2</sub>	10.02	11.56	11.69	10.74	11.00	0.97	0.98	0.97	1.07	1.00	26.85	27.13	27.04	29.63	27.66
V <sub>3</sub>	12.08	13.27	13.27	12.71	12.83	1.10	1.20	1.26	1.15	1.18	30.65	33.24	35.00	32.04	32.73
V <sub>4</sub>	13.50	14.13	14.62	13.75	14.00	1.20	1.24	1.25	1.22	1.23	33.43	34.54	34.63	33.98	34.14
V <sub>5</sub>	13.37	14.42	14.92	13.88	14.15	1.20	1.28	1.26	1.26	1.25	33.43	35.09	35.46	34.91	34.72
Mean	12.29	13.29	13.63	12.92	13.03	1.10	1.16	1.19	1.13	1.14	30.52	32.05	33.11	31.37	31.76
Comparison for Means of		S.E.m±		CD (5%)			S.E.m±		CD (5%)			S.E.m±		CD (5%)	
V		0.34		0.99			0.02		0.06			0.62		1.78	
G		0.31		0.88			0.02		NS			0.56		NS	
VxG		0.69		1.97			0.04		NS			1.76		NS	

NS- Non Significant

V<sub>1</sub>- A-1    V<sub>2</sub>- ICCV-2    V<sub>3</sub>- KAK-2    V<sub>4</sub>- Bheema    V<sub>5</sub>- BGD -103G<sub>1</sub>- Small    G<sub>2</sub>- Medium    G<sub>3</sub>- Big    G<sub>4</sub>- bulk

Table 3: Effect of Seed Size on Hundred Seed Weight, Germination Percentage and Seedling Dry Weight in Chickpea Genotype

Treatments	100 Seed Weight (gm)					Germination (%)					Seedling Dry Weight (mg)				
	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	Mean	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	Mean	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	Mean
V <sub>1</sub>	23.03	23.92	24.03	23.83	23.70	94.67 (75.02)	95.00 (76.21)	97.33 (79.54)	96.89 (78.78)	95.97 (77.39)	176.00	178.33	199.89	186.56	185.19
V <sub>2</sub>	25.86	26.2	26.69	26.17	26.23	93.78 (77.23)	94.00 (78.49)	94.11 (78.77)	93.78 (78.17)	93.92 (78.16)	202.56	212.33	215.78	206.89	209.39
V <sub>3</sub>	36.77	37.8	38.21	37.65	37.61	94.78 (76.77)	95.56 (77.80)	95.78 (78.21)	95.44 (77.65)	95.39 (77.61)	215.33	220.56	224.78	218.22	219.72
V <sub>4</sub>	37.34	38.77	39.36	38.11	38.40	95.22 (77.34)	96.22 (78.77)	96.44 (79.36)	95.78 (78.11)	95.92 (78.40)	220.33	226.33	234.11	223.44	226.06
V <sub>5</sub>	37.4	39.27	39.59	38.33	38.65	95.22 (77.40)	96.54 (79.27)	96.67 (79.59)	95.89 (78.33)	96.08 (78.65)	222.67	227.78	231.19	224.65	226.57
Mean	32.08	33.19	33.58	32.82	32.92	94.73 (76.75)	95.46 (78.11)	96.07 (79.09)	95.56 (78.21)	95.45 (78.04)	207.38	213.07	221.15	211.95	213.39
Comparison for Means of		S.E.m±		CD (5%)			S.E.m±		CD (5%)			S.E.m±	CD (5%)	S.E.m±	CD (5%)
V		0.27		0.78			0.37		NS			1.28	3.66	1.28	3.66
G		0.24		NS			0.33		0.99			1.14	3.27	1.14	3.27
VxG		0.54		NS			0.74		NS			2.56	NS	2.56	NS

NS- Non Significant

V<sub>1</sub>- A-1    V<sub>2</sub>- ICCV-2    V<sub>3</sub>- KAK-2    V<sub>4</sub>- Bheema    V<sub>5</sub>- BGD -103G<sub>1</sub>- Small    G<sub>2</sub>- Medium    G<sub>3</sub>- Big    G<sub>4</sub>- Bulk

Table 4. Effect of Seed Size on Electrical Conductivity in Chickpea Varieties

Treatments	Vigour Index					Electrical Conductivity (dSm <sup>-1</sup> )				
	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	Mean	G <sub>1</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>4</sub>	Mean
V <sub>1</sub>	1941	2045	2301	2245	2133	0.460	0.453	0.440	0.443	0.449
V <sub>2</sub>	2257	2385	2396	2315	2338	0.517	0.507	0.510	0.517	0.513
V <sub>3</sub>	2455	2589	2615	2515	2544	0.527	0.523	0.523	0.530	0.526
V <sub>4</sub>	2485	2648	2677	2535	2586	0.517	0.517	0.507	0.520	0.515
V <sub>5</sub>	2491	2687	2720	3142	2760	0.513	0.513	0.493	0.517	0.509
Mean	2326	2471	2542	2550	2472	0.507	0.503	0.495	0.505	0.502
Comparison for means of	S.E.m±		CD (5%)			S.E.m±		CD (5%)		
V	24.00		72.00			0.01		0.041		
G	22.00		65.00			0.01		NS		
VxG	48.00		145.00			0.03		NS		

NS- Non Significant	
Varieties (V)	Seed size (G)
V <sub>1</sub> - A-1	G <sub>1</sub> - Small
V <sub>2</sub> - ICCV-2	G <sub>2</sub> - Medium
V <sub>3</sub> - KAK-2	G <sub>3</sub> - Big
V <sub>4</sub> - Bheema	G <sub>4</sub> - Bulk
V <sub>5</sub> - BGD -103	